What can go wrong when moving DIRC ?

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What can go wrong when moving DIRC ?

- A trivial answer: “Everything…”
- Two possibilities:

  - Can we move the whole DIRC as a unit ?

  - Disassemble individual bar boxes from BaBar.
- Discussions with B. Ratcliff, J. Krebs, J. Rasson, R. Kadel. Unfortunately, could not ask B. Bell.

Two major concerns

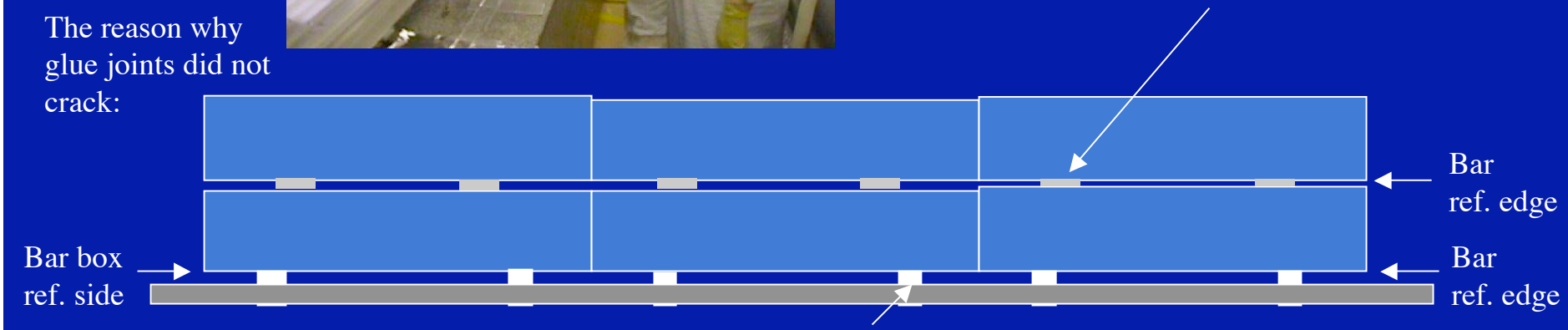
Protection of optical surfaces against pollution

- Quartz surface attracts dust. In the clean room we had a "class 10" air quality directly under the HEPA filters. Therefore, we worry about a negative pressure in bar boxes sucking dirty air from outside during the transport. We also worry also about a chemical pollution forming a thin film on the surface. We worry about pollution coming from fork-lifts, etc. Therefore the bar boxes should spend a minimum amount of time in IR2.
- We should maintain a positive pressure on the bar boxes and flow ideally boil-off N_2, or at least a dry air filtered with HEPA and charcoal/silica gel filters.
- During the installation we had short periods of no flow. No flow is certainly a better solution than flow with a dirty gas !

Protection against mechanical shocks

Aluminum shims of variable thicknesses
(they take care of variability in bar width
and ensure the uniform stresses on the glue)

The reason why
glue joints did not
crack:

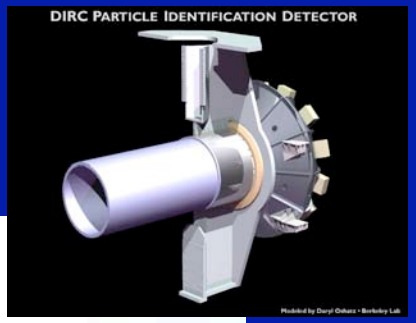


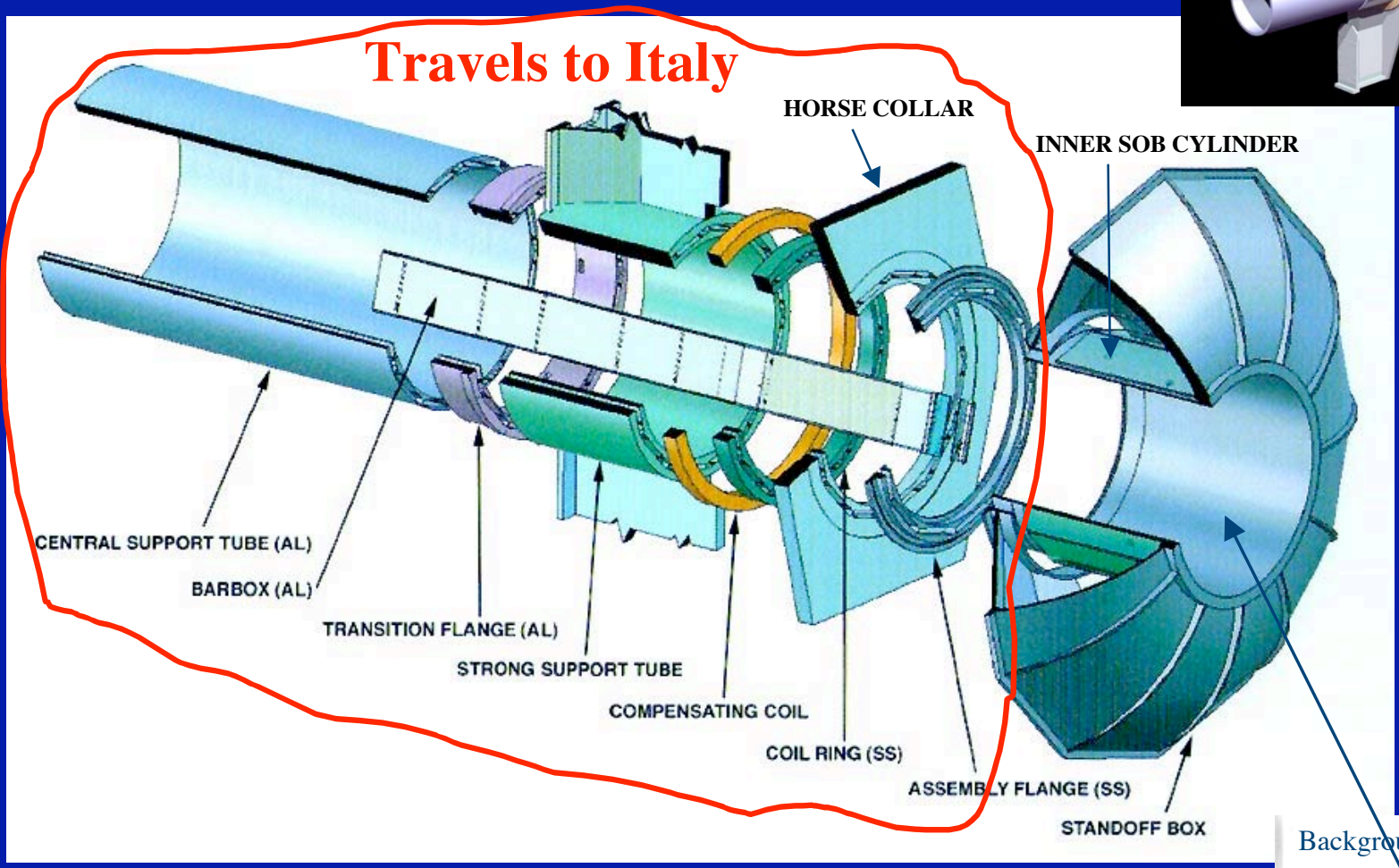
Nylon buttons (reference side of the bar box)

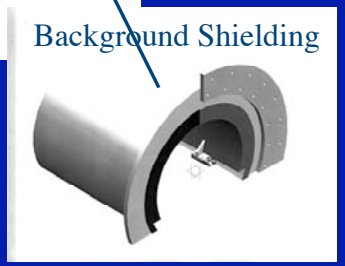
- Bar boxes have unique orientation - cannot be interchanged !!
- The bar rests on nylon buttons, which were aligned on the bar box reference side.
- Each bar box has its own spreadsheet, calculating very carefully Al shim thicknesses with typical values between 0.001" and 0.010", and determined to a precision of a 0.001" (~25μm).

DIRC disassembly

Individual DIRC parts







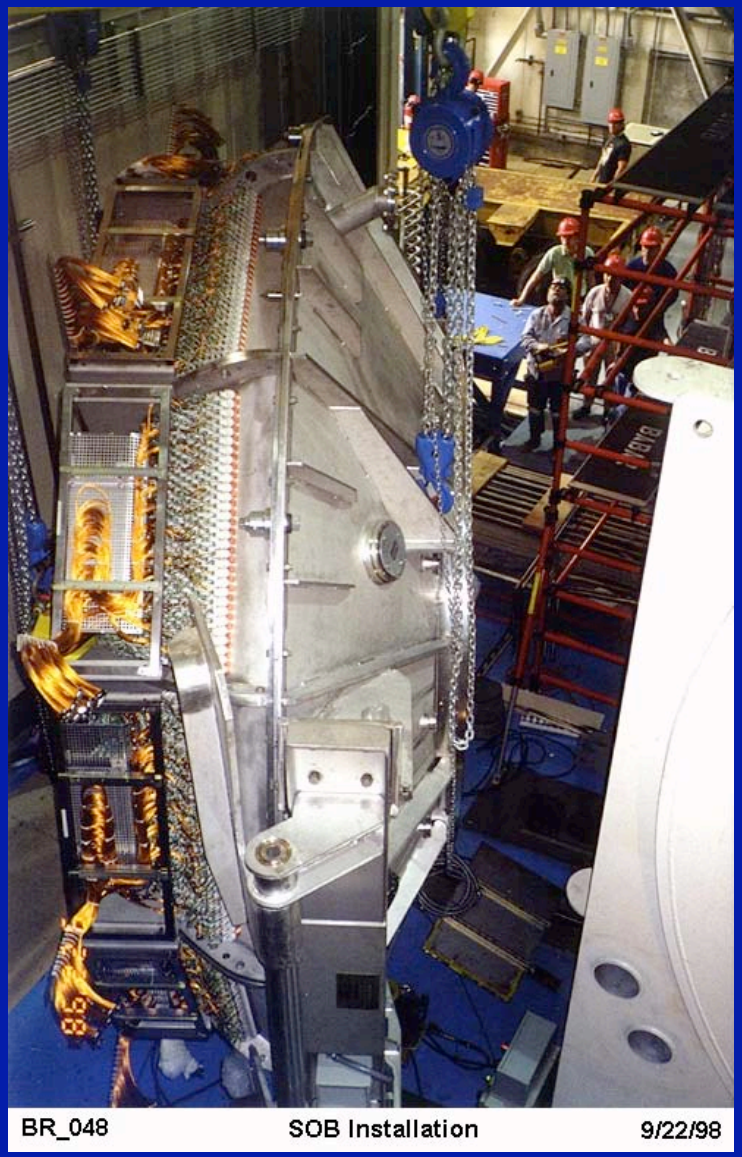
- All components travel to Italy, except SOB

Option #1:

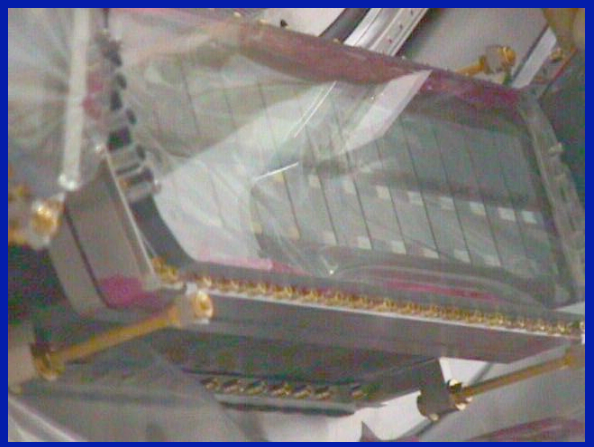
Take it apart the same way as it was installed with the same fixtures

(As one thinks about it, it is more and more a preferred choice)

Remove SOB as one unit ?



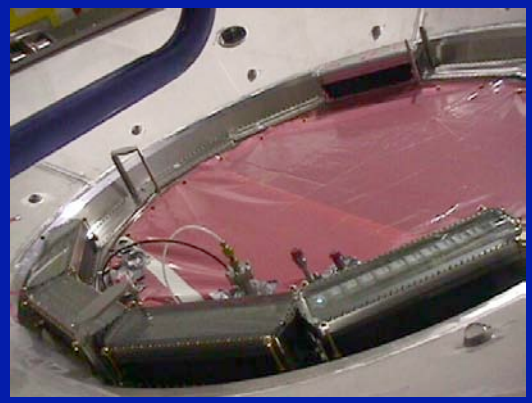
Inner SOB cylinder



SOB was installed first as one unit, however, with no bar boxes present and without the inner SOB cylinder in.

We installed the first 5 boxes outside the wall





- After 5 boxes were installed, the inner SOB cylinder comes in:

Inner SOB cylinder has to be removed

To be able to remove bar boxes.

Remaining 7 bar boxes installed on the beam line

- Fixtures to remove the boxes from BaBar do exist, but need to be “re-certified”






- We have still have access to two techs who were part of the installation (Matt McCulloch & Steve Dardin)

Store the bar boxes in the storage trailer

- To move the bar boxes outside the IR-2 hall, one needs a fixture and movable crane:

- To insert the bar box into the storage trailer, we need another movable crane (it exists, but it needs to be refurbished and "re-certified").

- The bar box storage trailer needs:
  a) a repair of air conditioning
  b) shock absorbers for safe transport & probably a new bar box support
  c) distribution of a boil-off N_2
  d) probably alarm to indicate if the air conditioning fails or flow stops.

Summary of worries for this option

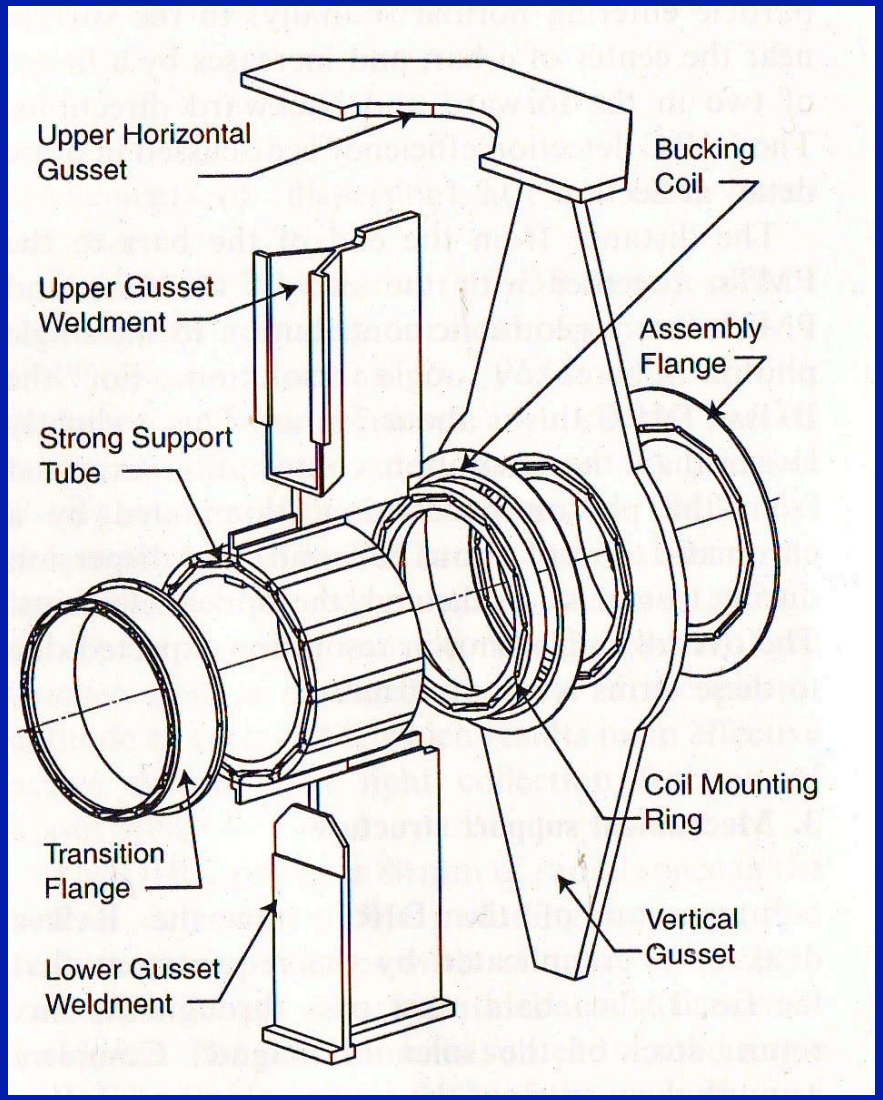
- Clearly, this option is not without the risks
- We do not know if the Epotek glue has still the original strength after many years of radiation exposure. May need to do some sample tests on “irradiated” and “non-irradiated” samples.
- We may need to make some repairs or modifications to the bar boxes. Where do we do it ? I would say in the SLAC clean room, which means a transport from IR2 to the clean room in bldg 121 located in the switch yard.
- Need to do a lot of work on the preparation of the storage trailer (evaluation of max. loads during the transportation, may need a remote monitoring of gas flow and humidity).
- During the transport, we need to:
  - maintain a N_2 gas flow
  - not to allow a moisture, dust, forklift fumes, or a chemical pollution entry into the bar boxes
  - maintain the positive gas pressure in the bar boxes
  - keep the temperature constant
- Once the bar boxes are in Italy, one needs to “certify” the gas system by exposing a “coupon full-length bar” to it and measuring the internal reflection coefficient. This was done in IR2 to certify the gas system there.

Option #2:

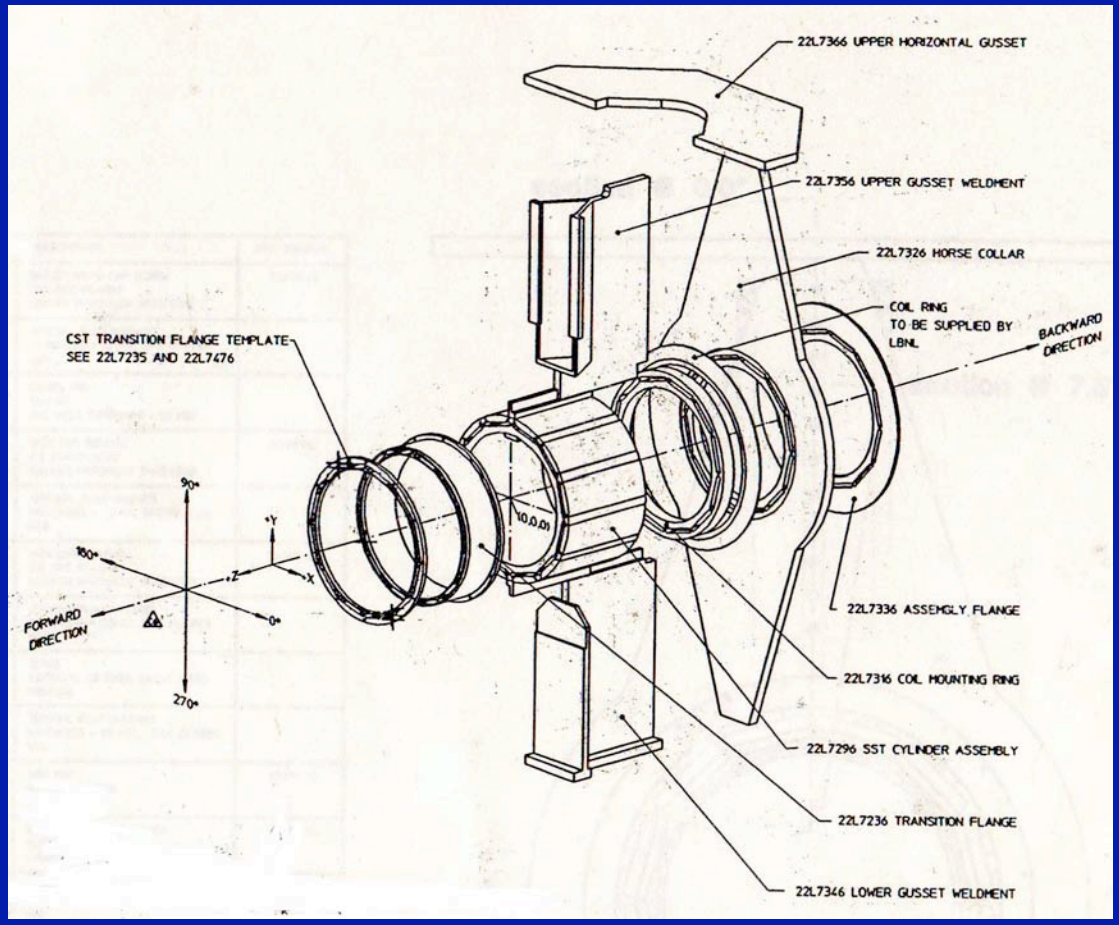
Move DIRC as a unit together with the central support tube ?

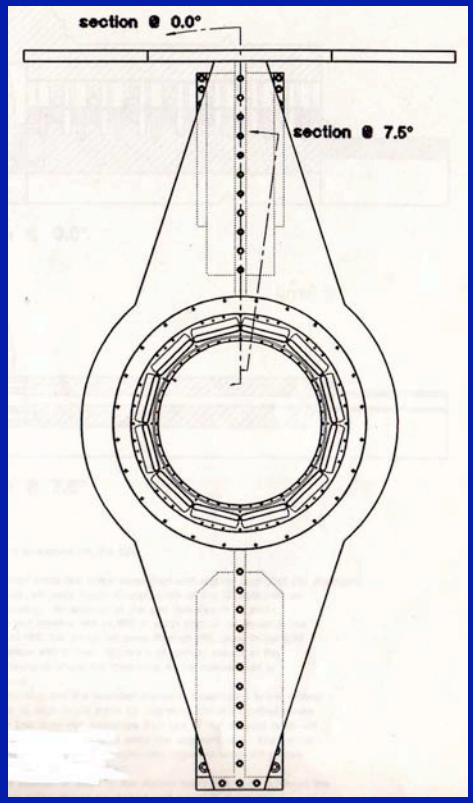
(Less and less attractive, as one thinks more about it)

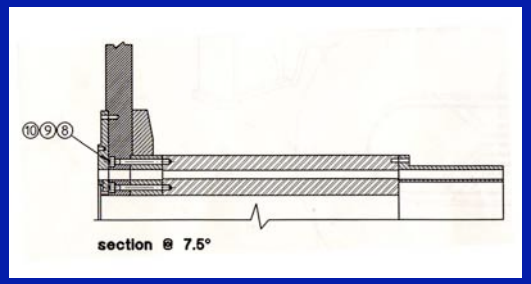
Can we disconnect the vertical gusset ?



Check mechanical drawings

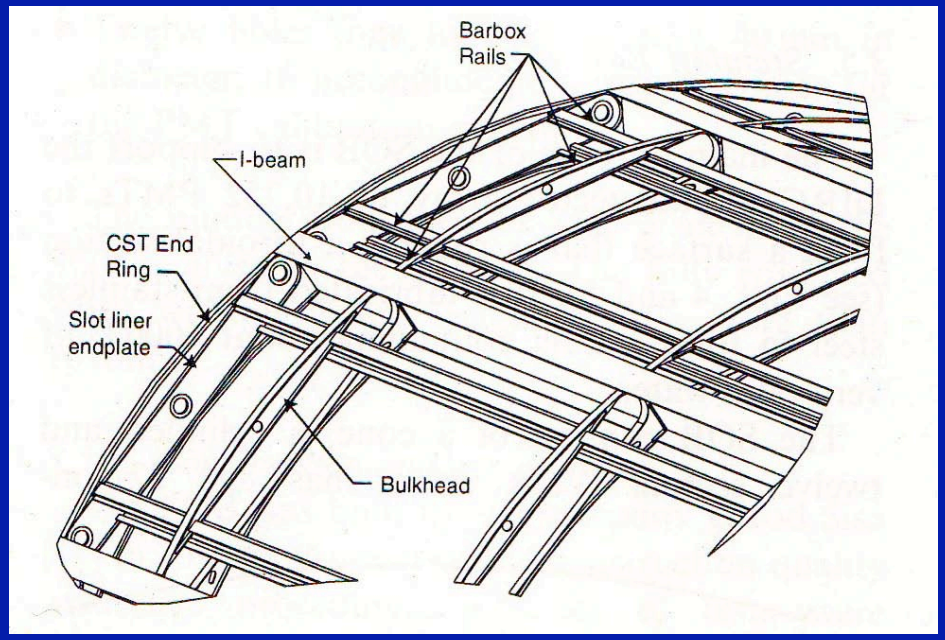


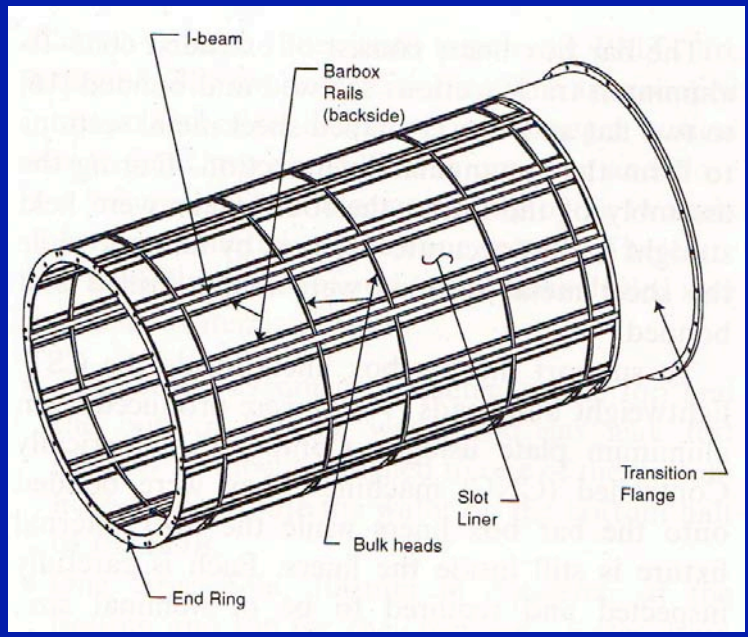




Bar boxes are captured by the horse collar
=> If we want to move the whole thing as a unit, it will need to include the horse collar.

Central support tube





- **The structure is built as an aircraft wing - very strong !**
- **However, it would have to be supported from the inner side during the transport.**

Summary of worries for this option

- Clearly, this option's main difficulty is the horse collar, which has to travel with bar boxes.
- This means that the bar box support cylinder cannot fit into a single trailer.
- It would not fit into a C5 airplane.
- It would have to sit on the deck of the boat.
- In addition, the horse collar has to be vertical, and as a result it requires quite high vertical space.
- The mechanical stresses during the transport with the horse collar need to be evaluated - may end up to be non-trivial.
- One needs to make a new special container for the central support tube & horse collar.
- During the transport, we need to:
  - maintain a N_2 gas flow
  - not to allow a moisture, dust, forklift fumes, or a chemical pollution entry into the bar boxes
  - maintain the positive gas pressure in the bar boxes
  - keep the temperature constant
- If we need to make some repairs or modifications to the bar boxes, we need to remove them from the central support cylinder => extra transport from IR2 to the clean room in bldg 121 and then installed in the central tube again !!
- Once the bar boxes are in Italy, one needs to "certify" the gas system by exposing a "coupon full-length bar" to it and measuring the internal reflection coefficient. This was done in IR2 to certify the gas system there.